

## The Parameters of Active Investing

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## **Abstract**

The merits of active and passive investing strategies have been debated for many years. This paper presents a twist on the classic debate by presenting theoretical parameters for the best-case and worst-case outcomes using active investing protocols in comparison to buy-and-hold investing strategies.

Using seven core equity and fixed-income indexes to represent all possible investment asset classes, the best-case and worst-case performance for active investing was estimated over three time frames: a 39-year period from 1970-2008, a 20-year period from 1989-2008, and a 10-year period from 1999-2008.

The 39-year average annualized buy-and-hold returns for each core index were as follows: Dow Jones Wilshire REIT Index 10.62%, Russell 2000 Index 10.25%, S&P Goldman Sachs Commodity Index 9.92%, S&P 500 Index 9.48%, Morgan Stanley Capital International EAFE Index 8.97%, Barclays Capital Intermediate Term Bond Index 8.13%, and 3 Month Treasury Bills 6.17%.

The performance of a single-index portfolio using an active trading strategy that selected the best performing index at the start of each year produced a 39-year average annualized return of 34.2%. Conversely, an active trading strategy that selected the worst performing index at the start of each year generated a 39-year average annualized return of -9.98%. An active trading strategy that selected the median performing index among the seven indexes at the beginning of each year produced an 8.10% average annualized return between 1970 and 2008.

Recognizing that perfect foresight is unavailable, an active trading strategy that randomly selected one of the seven indexes at the beginning of each year produced an average annualized return of 9.05% (based on a 1,000 samples).

Three additional active trading strategies were simulated: investing solely into the prior year's best performing index at the start of each year; investing solely into the prior year's middle performing index at the start of each year; and investing solely into the prior year's worst performing index at the start of each year.

The momentum strategy (investing in last year's best index) generated a 39-year return of 13.92%. The mean reversion strategy (last year's middle performing index) had a 39-year return of 9.85%, while the "dogs of the Dow" approach (the prior year's worst performing index) produced an annualized return of 8.47%. A single-asset portfolio using a randomly selected index performed better than a "dogs of the Dow" approach.

Recognizing that single-asset portfolios violate the concept of diversification, three passively and actively managed multi-index portfolios were simulated. The first was a 40/60 portfolio in which there was a 40% allocation in the S&P 500 Index and a 60% allocation in the Bond index. Its 39-year annualized buy-and-hold return was 8.74%, or just slightly better than a randomly generated single-index investment. Next, a 60/40 portfolio was tested. It had a 60% allocation in the S&P 500 and a 40% in the Bond index. Its 39-year buy-and-hold return was 9.01%. Finally, a portfolio was assembled that allocated money equally to all seven indexes. Its 39-year buy-and-hold return was 9.37%.

Both two-asset portfolios (40/60 and 60/40) as well as the equally-weighted 7-asset portfolio were then actively managed through a systematic rebalancing protocol in which each asset in the portfolio (either two or seven) was rebalanced back to its original weighting at the beginning of each year. In every case, the active rebalancing protocol increased return and lowered risk (as measured by standard deviation of return).

The actively managed 7-index portfolio had an ending account balance that was nearly \$114,000 higher than the buy-and-hold 7-index portfolio over the 39-year period. Performance comparisons between each buy-and-hold investing scenario and each active management protocol were also calculated for the 20-year period ending on December 31, 2008 and the 10-year period ending on the same date.

The actively rebalanced 7-index portfolio and the annually rebalanced 40/60 portfolio defined the efficient frontier using the averaged results from all three performance periods (39-year, 20-year, 10-year). Actively rebalancing a multi-index portfolio produced superior risk-adjusted results in comparison to a passive buy-and-hold multi-index portfolio.

Another distinct advantage of active rebalancing is that it creates more uniform account balances among the various assets in a multi-index portfolio. In the buy-and-hold 7-index portfolio, the terminal values in bonds and cash were dramatically lower than the terminal account values of bonds and cash in the actively rebalanced 7-index portfolio.

As bonds and cash have lower returns than equity and equity-like assets over long time horizons, they don't have the capacity to keep pace with the other portfolio components (in terms of dollar account value). As a result, the account balances of bonds and cash become disproportionately lower than the account balances of the equity components in the portfolio. This can be advantageous if, in the latter years of a portfolio, the equity-based assets perform well. But, if equity and equity-like assets suffer declines the investor can experience heavy losses because of their disproportionately large allocations in equity. The year 2008 would be a prime example of the risk in being over-weighted in equities for an investor that is in or near retirement.

The problem of disproportionate account balances in a multi-index portfolio is resolved by actively rebalancing. When the equity and equity-like assets of the portfolio have strong annual gains, their excess balances are rebalanced into the fixed income components of the portfolio (bonds and cash). Because bonds and cash seldom have negative returns, the gains are safeguarded in a fixed income "lock-box". In those years when the equity assets of the portfolio suffer declines the investor can turn to their fixed income lock-box assets to satisfy liquidity needs precisely because the active rebalancing has kept the fixed income assets systematically replenished.

Abstract: 930 words

# **The Parameters of Active Investing**

## **Introduction**

Of the many debates in the field of finance few have generated as much interest and spirited debate as the issue of active investing versus passive investing.

Empirical evidence in support of the superiority of passively managed portfolios is persuasive (See, for example, Davis, 2001; Arnott, Berkin and Ye, 2000; Sorensen, Miller and Samak, 1998; Carhart, 1997; Gruber, 1996; Malkiel, 1995; Brinson, Hood and Beebower, 1995). Conversely, equally sound empirical and/or logical evidence in defense of the value of active portfolio management has been presented (Pastor and Stambaugh, 2002; Wermers, 2000; Elton, Gruber and Blake, 1996; Etzioni, 1992). Moreover, "behavioral" arguments in favor of actively managed funds have been offered (Timbers, 1997).

This paper presents a twist on the classic debate by presenting theoretical parameters for the best-case and worst-case outcomes using active management. In addition, a variety of active management protocols are compared to buy-and-hold outcomes.

## **Background and Data**

The time frame covered in this study was the 39-year period from 1970-2008. Investment asset classes included in this analysis were seven core indexes: large-cap US equities, small-cap US equities, non-US equities, US intermediate term bonds, cash, real estate, and commodities (see Table 1).

The 39-year historical performance of large-cap US equities was represented by the S&P 500 Index, while the performance of small-cap US equities was captured by using the Ibbotson Small Companies Index from 1970-1978, and the Russell 2000 Index

from 1979-2007. The performance of non-US equities was represented by the Morgan Stanley Capital International EAFE Index (Europe, Australasia, Far East) Index. U.S. intermediate term bonds were represented by the Ibbotson Intermediate Term Bond Index from 1970-72 and the Lehman Brothers Intermediate Term Bond index from 1973-2007 (now called the Barclays Capital Intermediate Term Bond Index).

The historical performance of cash was represented by 3-month Treasury Bills. The performance of real estate was measured by using the annual returns of the NAREIT Index from 1970-1977. Annual returns for 1970 and 1971 were regression-based estimates inasmuch as the NAREIT Index (National Association of Real Estate Investment Trusts) did not provide annual returns until 1972. From 1978-2008 the annual returns of the Dow Jones Wilshire REIT Index were used. Finally, the historical performance of commodities was measured by the Goldman Sachs Commodities Index (GSCI). As of February 6, 2007, the GSCI is now known as the S&P GSCI Commodity Index.

Using the performance of these seven indexes the performance limits of active management were simulated.

### **Historical Performance**

The 39-year average annualized return of the large US stock from 1970-2008 was 9.48%. A buy-and-hold investor that chose to invest in only the S&P 500 Index would have turned a \$10,000 investment on January 1, 1970 into \$341,485 by December 31, 2008 (not adjusted for taxes, inflation, or fund expenses).

The performance of the S&P 500, a "passive" index, represents a typical hurdle against which active investment management of an equity portfolio is compared. There are several assumptions behind the performance figure of 9.48%. First, it implies a buy-and-hold investment with no additional investments or withdrawals. Second, there were

no tactical decisions made during the investment period—no overweighting or timing-based buys or sells.

The performance of several additional “passive” benchmarks (i.e., index-based buy-and-hold outcomes) are presented in Table 1. Also shown in Table 1 is the performance of several buy-and-hold multi-index portfolios. The first portfolio is a 40/60 allocation, representing a 40% allocation to US Large Stock (i.e., S&P 500) and a 60% allocation to bonds. This allocation represents a typical “income” fund or conservative balanced fund. A 40/60 portfolio had a 39-year annualized return of 8.74%, assuming the two allocations were never rebalanced back to the original 40/60 allocations.

The next multi-index portfolio is a 60/40 allocation, representing a 60% allocation to US Large Stock and a 40% allocation to bonds. This is a common allocation in a “balanced” fund. A \$10,000 total investment, where \$6,000 was invested in the S&P 500 and \$4,000 was invested in the bond index in 1970 (not rebalanced over the intervening 39 years) produced an ending total combined balance of \$289,144, for a 39-year annualized return of 9.01%.

The third multi-index portfolio consisted of equal allocations to each of the seven core indexes. It will be referred to as an equal-weighted 7-index portfolio. This type of portfolio is often referred to as an “asset allocation” fund. This portfolio had a 9.37% average annualized return over the 39-year period. It should be pointed out that asset allocation funds seldom employ equal weighting among the asset classes in the portfolio.

Each of the three multi-index portfolios produced equity-like returns with far less volatility when compared against the top three performing individual indexes (REITs, US Small Stock, and Commodities).

## Parameters of Active Investing

We will assume that an investor has access to only these seven indexes (or assets). The upper performance limit (or parameter) of **active investing** is achieved if the investor invests all their money on January 1<sup>st</sup> of each year in the index that will have the best performance in the upcoming year. This assumes perfect foresight (or luck).

So, for example, on January 1, 1970 the investor invested \$10,000 into the bond index (that is, a fund that mimics the bond index) because it had the best return of the seven indexes in 1970. In fact, it had a return of 16.86%. At the start of 1971 the investor shifts all of their money (\$11,686 by the end of 1970) into the EAFE index (i.e., EAFE clone fund) because it had the best return of the seven indexes in 1971 (a return of 29.59%). This pattern of perfect luck in annual index selection (or best-case active investing) continued annually through the end of 2008.

By the end of 2008, the investor's original \$10,000 at the start of 1970 was valued at \$958.9 million, equating to a 39-year average annualized return of 34.20% (see Table 2). This outcome is, of course, based on perfect foresight at the beginning of each year and does not represent a feasible outcome. It does, however, represent the theoretical limit of perfect active investing (assuming access to only these seven core indexes).

How about an active investor with median luck? This investor reallocated all of their investment assets at the start of each year into the index that ended up being the middle (or median) performer among the seven indexes by the end of the year. The ending account value of their initial \$10,000 investment in 1970 grew to a modest \$208,834 by the end of 2008. This growth represents a 39-year average annualized

return of 8.10% and was comparable to the 8.13% average annualized buy-and-hold return in the bond index.

The active investor with perfectly bad luck ended up reallocating their entire portfolio into the upcoming year's worst performing index at the start of each year. The ending value of their initial \$10,000 investment shrank to \$166, for a 39-year average annualized return of -9.98%.

We have now simulated the upper and lower performance parameters of active management using these seven core indexes over this 39-year period.

Table 1. 39-Year Buy-and-Hold Performance (1970-2008)

<b>Buy-and-Hold</b>	<b>39-Year Annualized Return (%) (1970-2008)</b>	<b>39-Year Standard Deviation of Annual Returns (%)</b>	<b>Growth of \$10,000</b>
<b>Buy-and-Hold Performance of 7 Core Assets</b>			
<b>REIT</b>	<b>10.62</b>	<b>20.09</b>	<b>513,069</b>
<b>US Small Stock</b>	<b>10.25</b>	<b>22.72</b>	<b>448,827</b>
<b>Commodities</b>	<b>9.92</b>	<b>25.56</b>	<b>399,818</b>
<b>US Large Stock</b>	<b>9.48</b>	<b>18.20</b>	<b>341,485</b>
<b>International Stock</b>	<b>8.97</b>	<b>23.08</b>	<b>285,009</b>
<b>Bonds (Intermediate)</b>	<b>8.13</b>	<b>5.36</b>	<b>210,633</b>
<b>Cash (3-Month T Bills)</b>	<b>6.17</b>	<b>3.13</b>	<b>103,237</b>
<b>Buy-and-Hold Performance of Multi-Asset Portfolios</b>			
<b>40/60 Portfolio</b> (40% US Large Stock, 60% Bonds)	<b>8.74</b>	<b>10.49</b>	<b>262,974</b>
<b>60/40 Portfolio</b> (60% US Large Stock, 40% Bonds)	<b>9.01</b>	<b>13.06</b>	<b>289,144</b>
<b>Equal-Weighted 7-Asset Portfolio</b> (14.29% allocation in each of the 7 core assets)	<b>9.37</b>	<b>16.88</b>	<b>328,868</b>

Table 2. 39-Year Active Management Performance

<b>Active Management Protocol</b>	<b>39-Year Annualized Return (%) (1970-2008)</b>	<b>39-Year Standard Deviation of Annual Returns (%)</b>	<b>Growth of \$10,000</b>
<b>Performance of Actively Managed Single Asset Portfolios</b>			
Select Best Performing Asset at Start of Each Year	<b>34.20</b>	<b>14.85</b>	<b>958,982,405</b>
Select Middle Performing Asset at Start of Each Year	<b>8.10</b>	<b>12.20</b>	<b>208,834</b>
Select Worst Performing Asset at Start of Each Year	<b>(9.98)</b>	<b>13.73</b>	<b>166</b>
<b>Randomly Selected Single Asset at Start of Each Year (1,000 samples)</b>			
Randomly Selected Single Asset at Start of Each Year (1,000 samples)	<b>9.05</b>	<b>18.69</b>	<b>293,168</b>
<b>Performance of Actively Managed Single Asset Portfolios (Prior Year)</b>			
Select Best Performing Asset From Prior Year (Momentum)	<b>13.92</b>	<b>24.18</b>	<b>1,611,240</b>
Select Middle Performing Asset From Prior Year (Mean Regression)	<b>9.85</b>	<b>20.24</b>	<b>389,628</b>
Select Worst Performing Asset from Prior Year (Dogs)	<b>8.47</b>	<b>19.25</b>	<b>238,370</b>
<b>Performance of Actively Managed Multi-Asset Portfolios (Annual Rebalancing)</b>			
<b>40/60 Portfolio</b> (40% US Large Stock, 60% Bonds with Annual Rebalancing)	<b>9.07</b>	<b>8.43</b>	<b>295,504</b>
<b>60/40 Portfolio</b> (60% US Large Stock, 40% Bonds with Annual Rebalancing)	<b>9.35</b>	<b>11.47</b>	<b>326,598</b>
<b>Equal-Weighted 7-Asset Portfolio</b> (14.29% allocation in each of the 7 core assets with Annual Rebalancing)	<b>10.21</b>	<b>10.50</b>	<b>442,671</b>

## **A Random Walk**

What about an investor that simply threw one dart at the seven indexes at the start of each year? In other words, an investor randomly selected one of the seven indexes at the start of each year and reallocated their entire portfolio into that index for the coming year. Based on 1,000 simulations, a portfolio that invested all assets into a randomly selected single index (from among the seven core indexes) at the start of each year produced an ending account balance of \$293,168 (based on a \$10,000 initial investment). The average annualized return was 9.05% over the 39-year period from 1970 to 2008.

We now have a new baseline performance parameter for active management during this 39-year period—an annualized return of 9.05%. Said differently, over this same 39-year period, an active management protocol (whatever it might have been) would have needed to generate an annualized return in excess of 9.05% to add value over a portfolio comprised of single-index selected at random at the beginning of each year.

It is worth noting that the randomly selected single-index portfolio outperformed the buy-and-hold performance of the MSCI EAFE Index, the bond index, and cash (or T bills). In fact, randomly selecting one index at the start of each year (and reallocating all assets into it) produced a 39-year average annual return that was only 43 bps lower than the return of the S&P 500 Index (9.05% vs. 9.48%).

The performance of this actively managed random portfolio changes the performance “hurdle” that active managers might be compared against. Rather than being compared against a buy-and hold passive index (such as the S&P 500), an actively managed portfolio would more correctly be compared against the performance of a

portfolio in which the sole investment asset is randomly selected at the beginning of each year.

To compare tactical active management against the performance of a passive buy-and-hold index is illogical. Simply put, determining whether or not **tactical** active investing adds value should be based on its performance in comparison to the performance of **random** active investment protocol.

### **Using Last Year's Results**

Assuming perfect luck, median luck, or worst-case luck in the selection of each year's sole investment is theoretically interesting, but not very practical. An active investing protocol that uses the performance results of each index from the previous year is more feasible. In other words, an active investor's choice of index to invest in for the coming year could be based upon the performance of all possible investment assets (in this case seven indexes) during the prior year. Performance of indexes (or any investment asset) in the previous year is information that is available to all investors at the beginning of each year.

As shown in Table 2, an active investing strategy based on "momentum" generated a 13.92% annualized return over the 39-year period. This active strategy consisted of reallocating all investment dollars into the previous year's best performance index. For example, the best performing index in 1970 was bonds. Thus, at the start of the next year (1971) all money was shifted into the bond index based on its performance in the prior year. By the end of 1971 the EAFE Index was the best performing asset, thus at the start of 1972 all money was shifted into the EAFE Index. This pattern was continued through 2008. This active investing protocol does not rely upon luck. Rather, it utilizes the known performance from the prior year to make each year's investment decision.

Another active investment approach selected the middle performing asset from the prior year. This is casually referred to as a “mean regression” approach, but may or may not reflect true mean regression behavior. This particular active investing protocol produced an annualized return of 9.85%, which was considerably lower than the momentum strategy over this particular 39-year period. Lastly, an active protocol that selected last year’s worst performing asset (or a so-called “Dogs of the Dow” approach) produced a 39-year annualized return of 8.47%.

### **Active vs. Passive Portfolios**

Each of these three approaches (“momentum”, “mean regression”, “dogs”) utilized only one of the seven indexes each year as the sole investment. This represents very concentrated investing. Far more common is the use of several different indexes (i.e., investment assets) in a portfolio, whether passively or actively managed.

In recognition of this, Table 2 also presents the performance of three actively managed multi-index portfolios: a 40/60 portfolio, a 60/40 portfolio, and an equal-weighted 7-index portfolio. The buy-and-hold performance of each multi-index portfolio was previously presented in Table 1.

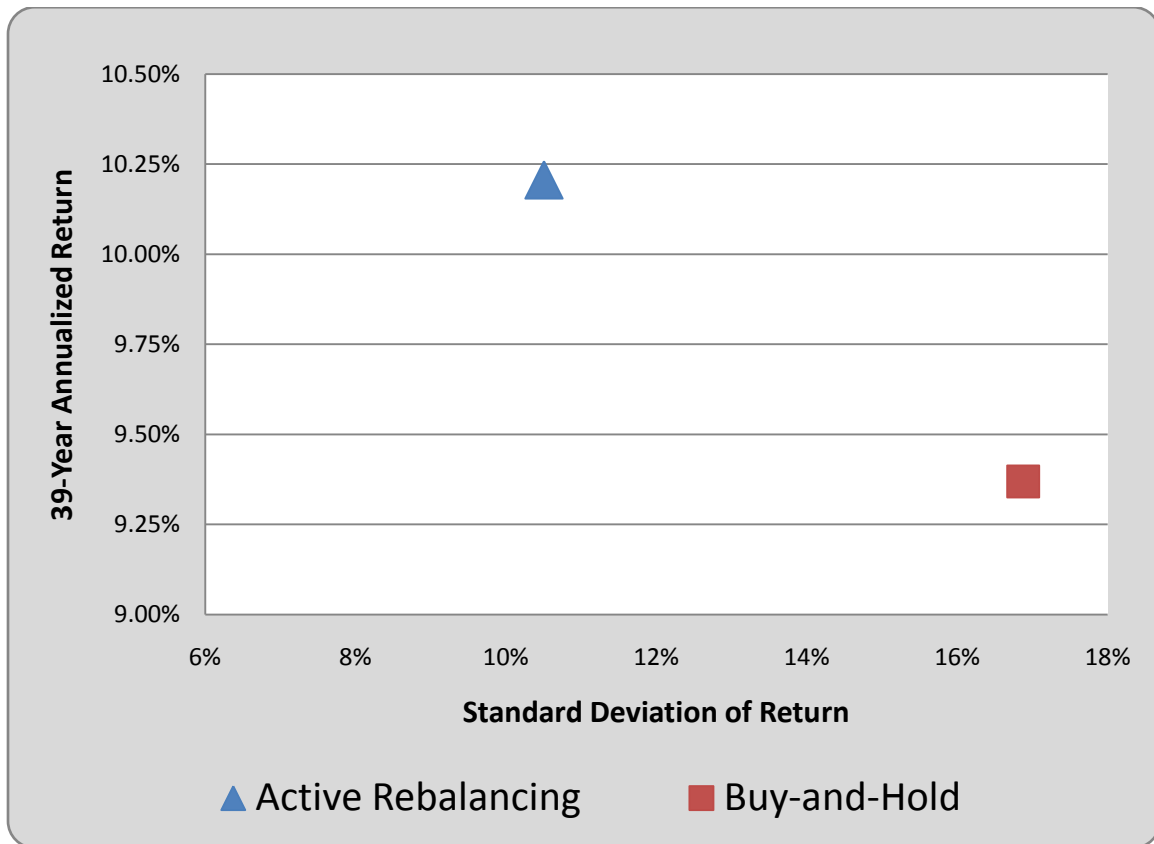
The active investing protocol being introduced at this point is very straightforward: systematic rebalancing. The simple “active” act of rebalancing each multi-index portfolio at the start of each year to bring each portfolio component back to its original allocation produced notable improvements in performance. The 40/60 portfolio improved from 8.74% using buy-and-hold to 9.07% using active rebalancing—which increased the ending account balance by over \$32,000. Importantly, the actively rebalanced 40/60 portfolio had 20% less volatility in the annual returns (as measured by standard deviation). More return with less risk.

The actively rebalanced 60/40 portfolio had a 34 bps higher annualized return compared to the buy-and-hold 60/40 portfolio and a standard deviation of annual returns that was 12% lower.

Finally, the annually rebalanced equal-weighted 7-index portfolio produced a 39-year annualized return of 10.21%, 84 bps higher than the buy-and-hold 7-index portfolio. The volatility of annual returns was nearly 40% lower in the actively rebalanced 7-index portfolio. Perhaps most compelling is an ending account balance that was nearly \$114,000 higher in the actively rebalanced 7-index portfolio.

Of all the investment comparisons examined to this point, the most meaningful is the actively rebalanced 7-index portfolio vs. the buy-and-hold 7-index portfolio. The risk/return comparison between these two over the past 39-years is presented below in Figure 1. There is a consequential benefit of actively rebalancing a multi-index portfolio. Doing so produces a higher return with less volatility in the annual returns.

Figure 1. Equal-Weighted 7-Index Portfolio: 39-Year Risk/Return Comparison



There is another benefit to active rebalancing. As shown in Table 3, the ending account balances in bonds and cash in the actively rebalanced 7-index portfolio were considerably higher than the bond and cash ending balances in the buy-and-hold multi-index portfolio. Why does this matter?

Bonds and cash have lower returns than equity and equity-like assets over long time frames and, as a result, will not be able to keep pace with the other portfolio components (in terms of dollar account value). Accordingly, the account balances will become disproportional over time (as demonstrated in Table 3). The equity and equity-like portfolio components (REITs and commodities) will tend to dominate the portfolio.

This can be advantageous if, in the latter years of a portfolio, the equity-based assets perform well. But, if equity and equity-like assets suffer declines the investor can experience heavy losses because of their disproportionately large allocations in equity.

This potential portfolio imbalance can be solved by the active strategy of rebalancing. When equity assets have strong annual gains, their excesses are diverted (i.e., rebalanced) to the fixed income components of the portfolio (bonds and cash). Because bonds and cash seldom have negative returns, the gains are preserved in a fixed income “lock-box”. As investors age, the notion of a lock box becomes very appealing. During equity market downturns (i.e., 2008) the bond and cash portfolio components—which have been systematically replenished through active rebalancing—will have sufficient reserves to provide needed liquidity.

Table 3. Total Ending Balances in Actively Rebalanced and Buy-and-Hold 7-Asset Portfolio (39-Year Period from January 1, 1970 to December 31, 2008)

\$1,428 starting balance in each of the 7 Indexes	<b>Large US Equity</b>	<b>Small US Equity</b>	<b>Non-US Equity</b>	<b>US Bonds</b>	<b>Cash</b>	<b>REIT</b>	<b>Commodities</b>	<b>Total Ending Portfolio Value (Growth of \$10,000)</b>
Actively Rebalanced 7-Index Portfolio	54,461	57,236	48,946	95,462	87,751	52,559	46,257	442,671
Buy-and-Hold 7-Index Portfolio	48,784	64,118	40,716	30,090	14,748	73,296	57,117	328,868

The performance of buy-and-hold portfolios and active investing over the 20-year period from January 1, 1989 to December 31, 2008 are summarized in Tables 4 and 5 and Figure 2. The benefits of active investing were again demonstrated when comparing the results of the 40/60, 60/40 and buy-and-hold 7-index portfolio against the performance of the same portfolios using active rebalancing. The rebalanced multi-asset portfolios had better risk-adjusted performance than the buy-and-hold multi-asset portfolios.

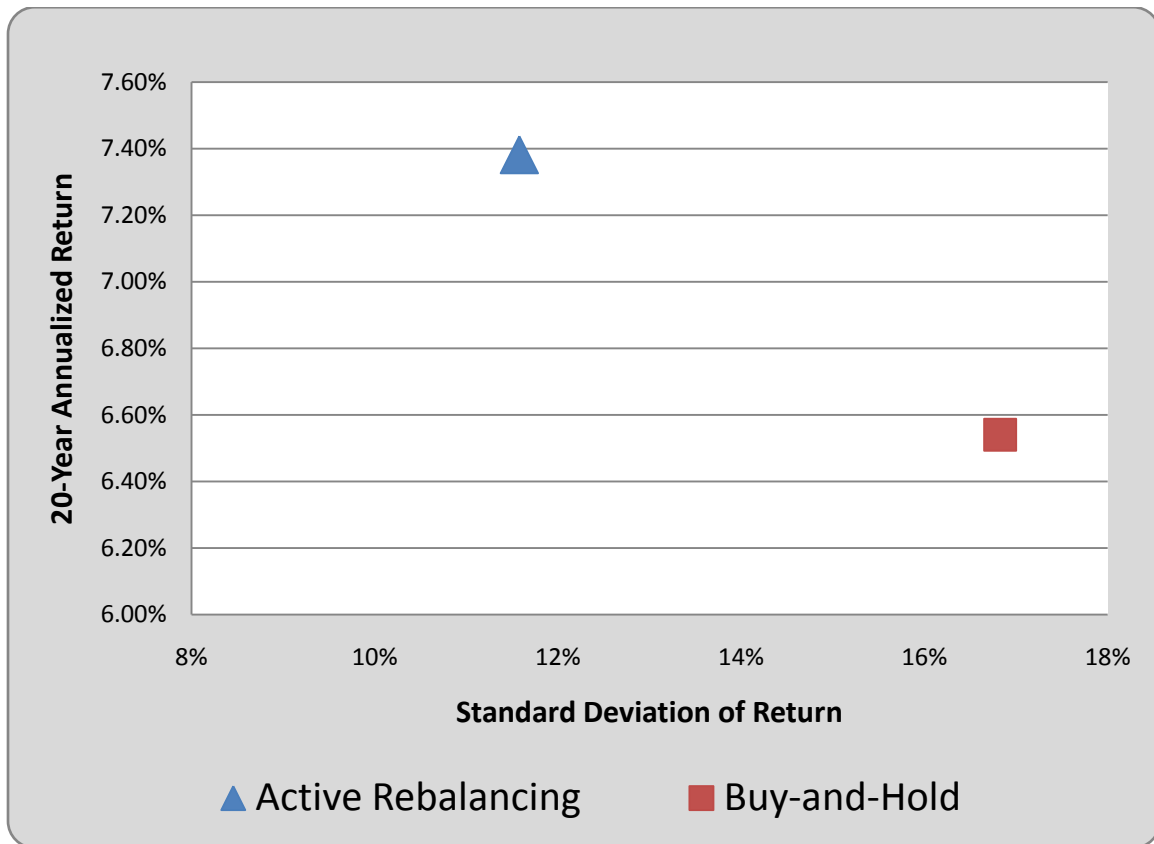
Table 4. 20-Year Buy-and-Hold Performance (1989-2008)

<b>Buy-and-Hold</b>	<b>20-Year Annualized Return (%) (1989-2008)</b>	<b>20-Year Standard Deviation of Annual Returns (%)</b>	<b>Growth of \$10,000</b>
<b>Buy-and-Hold Performance of 7 Core Assets</b>			
<b>US Large Stock</b>	<b>8.43</b>	<b>19.99</b>	<b>50,431</b>
<b>US Small Stock</b>	<b>7.86</b>	<b>20.62</b>	<b>45,404</b>
<b>REIT</b>	<b>7.48</b>	<b>21.48</b>	<b>42,308</b>
<b>Bonds (Intermediate)</b>	<b>7.03</b>	<b>4.55</b>	<b>38,911</b>
<b>Commodities</b>	<b>5.51</b>	<b>27.95</b>	<b>29,205</b>
<b>Cash (3-Month T Bills)</b>	<b>4.41</b>	<b>2.06</b>	<b>23,706</b>
<b>International Stock</b>	<b>3.14</b>	<b>21.13</b>	<b>18,573</b>
<b>Buy-and-Hold Performance of Multi-Asset Portfolios</b>			
<b>40/60 Portfolio</b> (40% US Large Stock, 60% Bonds)	<b>7.63</b>	<b>10.73</b>	<b>43,519</b>
<b>60/40 Portfolio</b> (60% US Large Stock, 40% Bonds)	<b>7.91</b>	<b>13.81</b>	<b>45,823</b>
<b>Equal-Weighted 7-Asset Portfolio</b> (14.29% allocation in each of the 7 core assets)	<b>6.54</b>	<b>16.83</b>	<b>35,505</b>

Table 5. 20-Year Active Management Performance

<b>Active Management Protocol</b>	<b>20-Year Annualized Return (%) (1989-2008)</b>	<b>20-Year Standard Deviation of Annual Returns (%)</b>	<b>Growth of \$10,000</b>
<b>Performance of Actively Managed Single Asset Portfolios</b>			
Select Best Performing Asset at Start of Each Year	<b>30.92</b>	<b>11.74</b>	<b>2,189,268</b>
Select Middle Performing Asset at Start of Each Year	<b>6.77</b>	<b>12.97</b>	<b>37,093</b>
Select Worst Performing Asset at Start of Each Year	<b>(13.22)</b>	<b>14.49</b>	<b>587</b>
<b>Randomly Selected Single Asset at Start of Each Year (1,000 samples)</b>			
Randomly Selected Single Asset at Start of Each Year (1,000 samples)	<b>6.24</b>	<b>18.63</b>	<b>33,549</b>
<b>Select Best Performing Asset From Prior Year (Momentum)</b>			
Select Best Performing Asset From Prior Year (Momentum)	<b>6.20</b>	<b>22.53</b>	<b>33,273</b>
<b>Select Middle Performing Asset From Prior Year (Mean Regression)</b>			
Select Middle Performing Asset From Prior Year (Mean Regression)	<b>4.18</b>	<b>14.99</b>	<b>22,696</b>
<b>Select Worst Performing Asset from Prior Year (Dogs)</b>			
Select Worst Performing Asset from Prior Year (Dogs)	<b>5.39</b>	<b>23.39</b>	<b>28,558</b>
<b>Performance of Actively Managed Multi-Asset Portfolios (Annual Rebalancing)</b>			
<b>40/60 Portfolio</b> (40% US Large Stock, 60% Bonds with Annual Rebalancing)	<b>8.10</b>	<b>8.47</b>	<b>47,506</b>
<b>60/40 Portfolio</b> (60% US Large Stock, 40% Bonds with Annual Rebalancing)	<b>8.40</b>	<b>12.15</b>	<b>50,177</b>
<b>Equal-Weighted 7-Asset Portfolio</b> (14.29% allocation in each of the 7 core assets with Annual Rebalancing)	<b>7.38</b>	<b>11.58</b>	<b>41,555</b>

Figure 2. 20-Year Risk/Return of Equal-Weighted 7-Index Portfolio



Tables 6 and 7 report the performance of buy-and-hold portfolios vs. actively managed portfolios over the 10-year period from January 1, 1999 to December 31, 2008. As in the 39-year period and the 20-year period, the benefits of active investing were again demonstrated in the most recent 10-year period in which there were four bear market years (2000, 2001, 2002, and 2008).

The actively rebalanced multi-asset portfolios (40/60, 60/40, and 7-index portfolio) had superior risk-adjusted returns compared to the buy-and-hold multi-asset portfolios. Figure 3 shows the risk and return of the rebalanced 7-index portfolio and the buy-and-hold 7-index portfolio over the 10-year period.

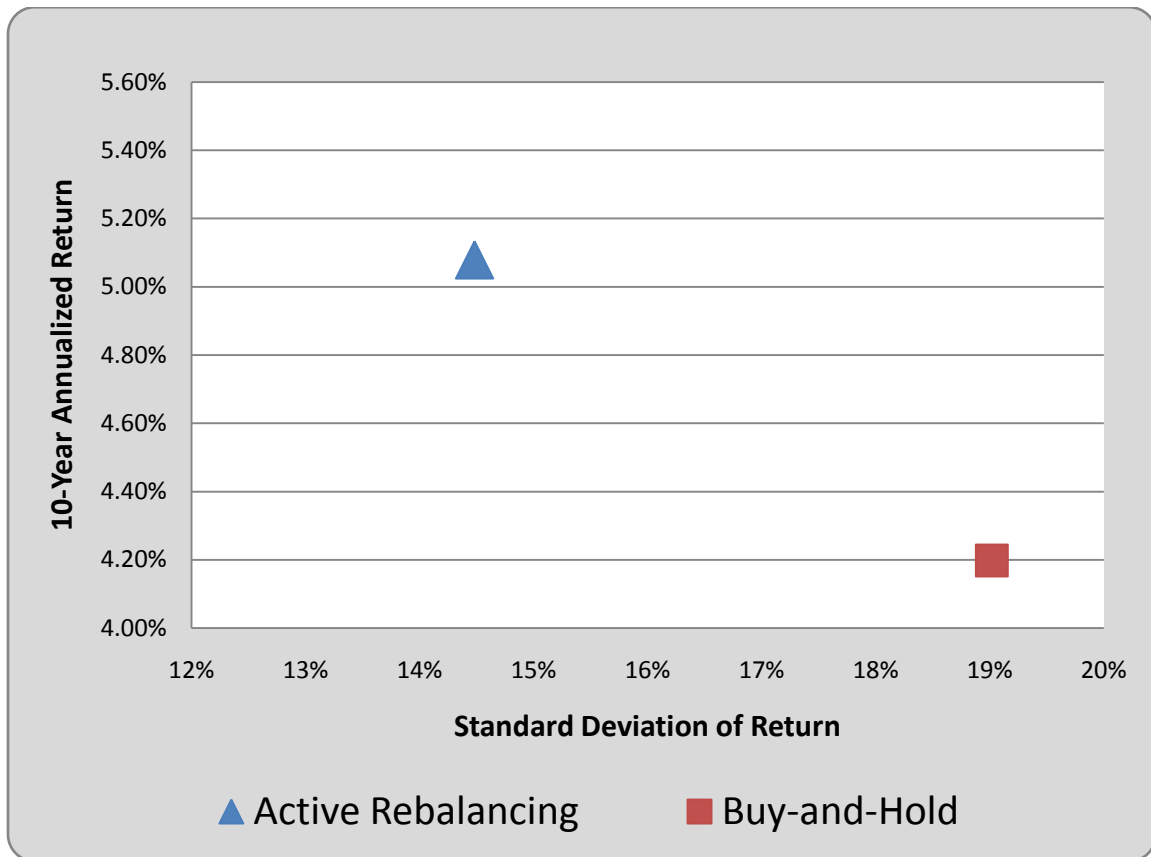
Table 6. 10-Year Buy-and-Hold Performance (1999-2008)

<b>Buy-and-Hold</b>	<b>10-Year Annualized Return (%) (1999-2008)</b>	<b>10-Year Standard Deviation of Annual Returns (%)</b>	<b>Growth of \$10,000</b>
<b>Buy-and-Hold Performance of 7 Core Assets</b>			
<b>REIT</b>	<b>7.65</b>	<b>25.24</b>	<b>20,897</b>
<b>Commodities</b>	<b>7.35</b>	<b>32.42</b>	<b>20,326</b>
<b>Bonds (Intermediate)</b>	<b>5.74</b>	<b>4.02</b>	<b>17,469</b>
<b>Cash (3-Month T Bills)</b>	<b>3.36</b>	<b>1.87</b>	<b>13,911</b>
<b>US Small Stock</b>	<b>3.02</b>	<b>22.79</b>	<b>13,469</b>
<b>International Stock</b>	<b>0.80</b>	<b>26.35</b>	<b>10,829</b>
<b>US Large Stock</b>	<b>(1.38)</b>	<b>20.45</b>	<b>8,699</b>
<b>Buy-and-Hold Performance of Multi-Asset Portfolios</b>			
<b>40/60 Portfolio</b> (40% US Large Stock, 60% Bonds)	<b>3.39</b>	<b>10.59</b>	<b>13,961</b>
<b>60/40 Portfolio</b> (60% US Large Stock, 40% Bonds)	<b>2.01</b>	<b>13.88</b>	<b>12,207</b>
<b>Equal-Weighted 7-Asset Portfolio</b> (14.29% allocation in each of the 7 core assets)	<b>4.20</b>	<b>19.02</b>	<b>15,086</b>

Table 7. 10-Year Active Management Performance

<b>Active Management Protocol</b>	<b>10-Year Annualized Return (%) (1999-2008)</b>	<b>10-Year Standard Deviation of Annual Returns (%)</b>	<b>Growth of \$10,000</b>
<b>Performance of Actively Managed Single Asset Portfolios</b>			
Select Best Performing Asset at Start of Each Year	<b>31.41</b>	<b>13.07</b>	<b>153,545</b>
Select Middle Performing Asset at Start of Each Year	<b>5.03</b>	<b>17.77</b>	<b>16,341</b>
Select Worst Performing Asset at Start of Each Year	<b>(16.09)</b>	<b>15.97</b>	<b>1,731</b>
<b>Randomly Selected Single Asset at Start of Each Year (1,000 samples)</b>			
Randomly Selected Single Asset at Start of Each Year (1,000 samples)	<b>3.95</b>	<b>20.96</b>	<b>14,733</b>
<b>Select Best Performing Asset From Prior Year (Momentum)</b>			
Select Best Performing Asset From Prior Year (Momentum)	<b>(2.48)</b>	<b>29.01</b>	<b>7,783</b>
<b>Select Middle Performing Asset From Prior Year (Mean Regression)</b>			
Select Middle Performing Asset From Prior Year (Mean Regression)	<b>(1.60)</b>	<b>18.14</b>	<b>8,507</b>
<b>Select Worst Performing Asset from Prior Year (Dogs)</b>			
Select Worst Performing Asset from Prior Year (Dogs)	<b>8.03</b>	<b>26.45</b>	<b>21,647</b>
<b>Performance of Actively Managed Multi-Asset Portfolios (Annual Rebalancing)</b>			
<b>40/60 Portfolio</b> (40% US Large Stock, 60% Bonds with Annual Rebalancing)	<b>3.57</b>	<b>6.31</b>	<b>14,208</b>
<b>60/40 Portfolio</b> (60% US Large Stock, 40% Bonds with Annual Rebalancing)	<b>2.17</b>	<b>10.97</b>	<b>12,400</b>
<b>Equal-Weighted 7-Asset Portfolio</b> (14.29% allocation in each of the 7 core assets with Annual Rebalancing)	<b>5.08</b>	<b>14.48</b>	<b>16,412</b>

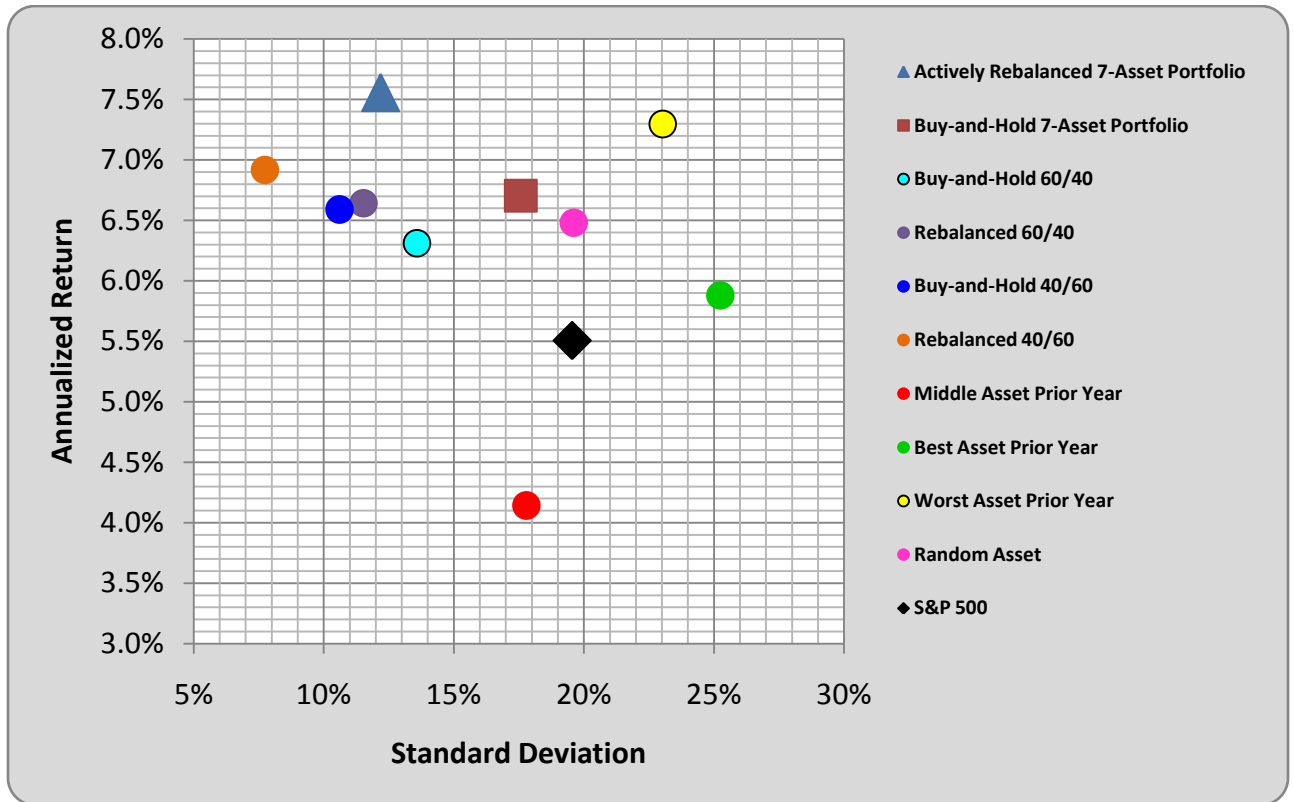
Figure 3. 10-Year Risk/Return of Equal-Weighted 7-Index Portfolio



A risk/return summary graph is presented as Figure 4. The results reflect the average of three annualized returns (39-year, 20-year, and 10-year) as well as the average of three standard deviations (39-year, 20-year, and 10-year) for each passive or active strategy. The S&P 500 is also included as a relative risk/return benchmark.

The superiority of active rebalancing in contrast to buy-and-hold is clearly demonstrated. Indeed, the actively rebalanced 7-index portfolio and the rebalanced 40/60 portfolio define the efficient frontier. All other active or passive strategies are inferior.

Figure 4. Return and Standard Deviation: Average Across Three Periods (39-Years, 20-Years, 10-Years)



### Summary

The upper limit (or maximum parameter) of active investing is an annualized return of 30% to 34%. This requires perfect luck or perfect foresight, neither of which represents a defensible tactical active strategy. By contrast, a portfolio with a randomly selected asset at the beginning of each year generated a 9.05% annualized return over the 39-year period from 1970-2008, a 6.24% annualized return over the 20-year period from 1989-2008, and a 3.95% annualized return over the 10-year period ending in

2008. The “random portfolio” results represent the threshold performance against which an active investing strategy might be measured.

A 7-index portfolio with active rebalancing beat the random strategy by 116 bps over the 39-year period, representing a higher ending balance of nearly \$150,000 (assuming an initial investment of \$10,000). Over the 20-year period ending in 2008, the 7-index portfolio with active rebalancing outperformed the random active strategy by 114 bps, or \$8,006. For the 10-year period, the actively rebalanced 7-index portfolio beat the random strategy by 113 bps, producing a \$1,679 higher ending account balance. The buy-and-hold 7-index portfolio beat the random portfolio by only 32 bps over 39-years, by 30 bps over 20-years, and by 25 bps over the 10-year period.

Systematic rebalancing in a multi-asset portfolio is a potent active strategy that seldom receives the attention it deserves. It is often simply assumed to be “a good idea”. This research has quantitatively demonstrated just how good it is.

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